Carbon Account for Transport

The Scottish Government

Carbon Account for Transport

Contents

Chapter 1: Introduction

The Government Economic Strategy[1] states that the Purpose of the Scottish Government is to:

"focus the Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth" (The Government Economic Strategy, p1).

This Strategy will be given momentum by a number of challenging targets. Two of which are:

- To reduce emissions over the period to 2011,
- To reduce emissions by 80% by 2050[2].

In support of the Strategy, the Climate Change (Scotland) Act received Royal Assent on August 4, 2009. Part 1 of the Act, creates the statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim 42% reduction target for 2020, with the power for this to be varied based on expert advice, and an 80% reduction target for 2050. To help ensure the delivery of these targets, this part of the Act also requires that the Scottish Ministers set annual targets, in secondary legislation, for Scottish emissions from 2010 to 2050.

Meeting the ambitious emission reduction targets will be challenging, and all sectors will need to play their part. Tackling emissions from transport will be crucial and, while many of the levers which are most likely to effect change are reserved policy, such as vehicle taxation and fuel duty, there is still considerable scope for devolved polices to make a difference.

The National Transport Strategy (NTS)[3], published in 2006 and endorsed by Scottish Ministers following the election in May 2007, outlined three key strategic outcomes for Transport in Scotland:

[1] The Government Economic Strategy (2007), The Scottish Government
[2] Compared to a 1990/95 baseline
[3] Scotland's National Transport Strategy (2006), The Scottish Executive

- Improve journey times and connections,
- Reduce emissions,
- Improve quality, accessibility and affordability.

The 'reduced emissions' outcome included a commitment to develop a carbon balance sheet for transport with the expectation that:

"This will present the impact of all Scottish transport policies and projects that are expected to have a significant impact on carbon, whether positive or negative."(National Transport Strategy, p46)

This commitment is met by the publication of this Carbon Account for Transport (CAT). It is to be used to monitor and review progress towards achievement of the 'reduced emissions' strategic outcome for transport. In doing this, it will support the development and implementation of actions to reduce emissions in accordance with the targets in the Climate Change (Scotland) Act.

The CAT itself, however, is not a decision making tool at an individual project or policy level. Scottish Transport Appraisal Guidance (STAG) remains the process for appraising new policies and projects, with the impact on the environment being one of the five criteria considered.

Showing the level of greenhouse gas emissions, measured in carbon dioxide equivalents (CO_{2e}), of the Scottish transport sector over time, the CAT helps explain which transport policies and projects are forecast to have the most significant influence on changes in emission levels. Measures are split between those that are infrastructure projects and those that are fiscal policies or regulatory measures. Importantly, to avoid misrepresentation of the data, the CAT does not attempt to aggregate the impact of these measures or to compare them to a business as usual baseline. The reader should be aware of this, and the caveat that the comparison, addition or netting off of emissions estimates between interventions or against a baseline, may lead to incorrect conclusions being drawn.

The approach of the CAT is transparent and open, outlining the expected impact of transport projects/policies on emissions to a greater extent than simply focusing on traffic growth. It will be updated on an annual basis, and should help to ensure that the Scottish Government systematically considers the carbon emissions impact of its transport decisions.

The CAT is not about rejecting any project/policy with a negative impact upon emissions, but is about supporting the development of solutions that promote economic growth and environmental quality and responsibility as mutually advancing through the availability of robust data. At the Scotland-wide level, this will mean encouraging those measures which reduce emissions and minimising the impact of policies and projects which increase emissions.

In achieving these objectives, the CAT will constitute an important element of a wider framework adopted across the Scottish Government with the aim of reducing emissions. At a Scottish Government wide level, the Climate Change Delivery Plan[4] sets out how we will achieve the statutory emissions targets which lie at the heart of the Climate Change (Scotland) Act. The Plan sets out what we need to do now, and in the medium and long term, to achieve our ambitious emissions reduction targets. It is a precursor to the more detailed statutory Report on Proposals and Policies to be produced in 2010, which will set out how we will meet our annual targets out to 2022.

The Carbon Assessment Project is simultaneously taking forward a commitment to develop and implement a framework and set of tools to assess the carbon impact of individual Scottish Government policies, programmes and projects, and the carbon impact of total Government spend. An important element of this project will be to develop a mechanism for using individual and high level carbon impact assessments to drive down emissions attached to government spend.

[4] Climate Change Delivery Plan: Meeting Scotland's Statutory Climate Change Targets (2009), The Scottish Government

There is also an ongoing transport research and analytical programme that is developing the evidence base on the likely cost and emissions impact of a range of potential future policies. The evidence from the full range of this analysis, including that from the CAT, as well as the NTS commitments, the targets specified within the Climate Change (Scotland) Act and the Climate Change Delivery Plan, will help to dictate the direction of future transport policy.

Chapter 2: Background Emissions Analysis

2.1 Background

The emissions data presented in this chapter is from the *'Greenhouse Gas Inventory for England, Scotland, Wales and Northern Ireland: 1990-2006'*[5] (GHGI) unless clearly stated otherwise. The GHGI is compiled on an annual basis and the full time series of all greenhouse gases is updated to take account of improved data and any advances in methodology used to estimate emissions. The greenhouse gases associated with transport and recorded by GHGI are Carbon Dioxide (CO_2), Nitrous Oxide (N_2O) and Methane (CH_4). Transport emissions recorded include those from road transport, aviation (and airport support vehicles), railways and maritime transport[6]. While domestic aviation and shipping emissions are reported in the GHGI, emissions associated with international aviation and shipping are not. However, an indicative assessment of emissions from international aviation and shipping associated with the devolved administrations, using existing data sources, was published in 2008[4]. Consequently, in line with the Scottish Government commitment to include emissions from international aviation and international shipping within the targets set by the Climate Change (Scotland) Act, references to aviation and maritime emissions in this document refer to both domestic and international, unless otherwise stated.

The transport emissions included are only emissions at the point of use (tailpipe emissions). Consequently, no lifecycle impacts within the transport infrastructure and no displaced impacts, such as the emissions generated from electrified railways, are included.

2.2 Historic Emissions Trends

Transport in Scotland produced emissions of 15,001 kilo-tonnes of carbon dioxide equivalent ($ktCO_2e$) in 2006. This represents growth of 3.3% from 2005, and an

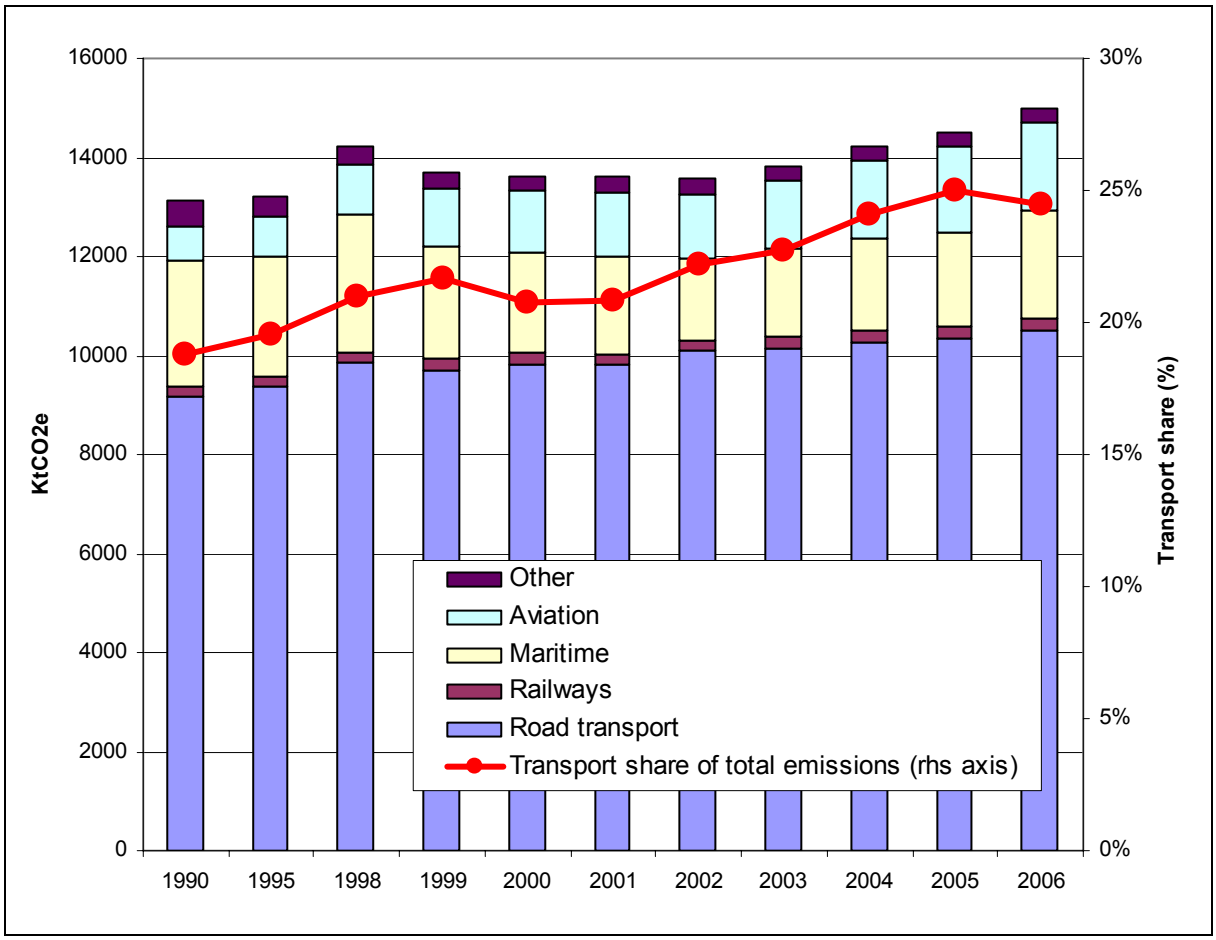
[5] Greenhouse Gas Inventory for England, Scotland, Wales and Northern Ireland: 1990-2006 (2008), AEA Technology

[6] The figures will not reconcile precisely with those presented in the Climate Change Delivery Plan due to minor differences in the definition of the 'Transport' sector.

average annual growth rate of 0.8% p.a. from 1990. Such levels and growth of transport emissions can be influenced by a wide range of factors, both short and long-term in their nature, with differing levels of government control and differing levels of possible quantification. Some of the key influences may include the following: car ownership levels; global oil prices; household income; population; land planning and use; public transport provision; and culture and lifestyles.

As a percentage of total Scottish emissions, the 15,001ktCO_2e from transport accounted for 24.4% in 2006. This is only the second year since 2000 in which transport's share of total emissions has decreased, although it is still considerably higher than the level of 18.8% it recorded in 1990. Figure 1 below shows the growth in transport emissions by sector, and the proportion of total Scottish emissions accounted for by transport (measured on the right hand axis), since 1990.

Figure 1: Emissions from Scottish transport, 1990 – 2006



Analysis by sector

Disaggregating the total transport figure, road transport is the sector with the greatest emissions, accounting for 10,506ktCO_{2e} in 2006. This is equivalent to 70.0% of all Scottish transport emissions during the year.

Looking at the long-term emissions growth from the different sectors, the fastest growing sector has been aviation, with an average rate of 6.0% p.a. since 1990. During this same period, the average growth in emissions from road transport was 0.9% p.a. In contrast, the sector with the strongest growth in emissions between 2005 and 2006 was maritime transport, with a growth rate of 14.0%. During this same year, the growth in emissions from road transport was 1.6%.

Transport emissions in Scotland as a proportion of those in the UK are similar to Scotland's equivalent share of the UK population. On a simple per capita basis, we would expect Scottish transport emissions to measure roughly 8.4% of total UK transport emissions[7]; in reality, Scotland accounts for 8.2%. This share has stayed broadly constant since 1999.

Railways and maritime transport are the only two sectors where emissions in Scotland are disproportionately higher than those across the UK. The Scottish proportions of total UK emissions from these sectors are 10.3% and 17.4% respectively, although the share of UK maritime emissions has consistently trended downwards since 1990. Aviation is the only sector where emissions are disproportionately lower than in the UK, although this figure may be skewed by people from Scotland making international journeys via airports elsewhere in the UK[8]. Direct international aviation accounts for 63% of total Scottish aviation emissions and 94% of total UK aviation emissions. The Scottish proportion of UK road transport emissions is roughly the same as the 8.4% population proportion, but has increased slightly since 1999. Table 1 overpage summarises these figures.

[7] GROS and ONS latest population estimates (mid-June 2006) for Scotland and the UK are 5,116,900 and 60,587,000 respectively.
[8] Under GHGI methodology, aviation emissions are allocated to the country of departure.

Table 1: Emission levels and trends in all transport sectors

Sector	Emissions 2006 (ktCO_2e)	% of Transport emissions (2006)	Average growth p.a. (1990-2006)	Growth (2005 – 2006)	% of equivalent UK average emissions
Road transport	10506	70.0%	0.9%	1.6%	8.4%
Maritime	2159	14.4%	-1.0%	14.0%	17.4%
Aviation	1792	11.9%	6.0%	2.7%	4.7%
Other	293	2.0%	-3.5%	-0.4%	8.8%
Railways[9]	251	1.7%	0.9%	2.4%	10.3%
Total	15001	100.0%	0.8%	3.3%	8.2%

Analysis by road vehicle source

Within road transport, we can categorise emissions by source or by road type. Cars are the source with the greatest emissions, accounting for 6,055ktCO_2e in 2006. Whilst emissions from cars have fallen since their peak in 2002, this figure is still equivalent to 57.6% of Scottish road transport emissions, and 40.4% of total Scottish transport emissions, in that year.

Between 1990 and 2006, the average growth rate in emissions from cars has been 0.3% p.a. However, between 2005 and 2006 emissions from cars fell by -0.1%.

In contrast, emissions from HGVs, and LGVs especially, continue to grow significantly. LGV-based emissions grew by an average of 4.2% p.a. from 1990, and by 5.2% between 2005 and 2006. HGV emissions, starting from a higher base, grew by an average of 0.5% p.a. from 1990, and by 2.7% between 2005 and 2006. Table 2 below gives the full set of figures for road transport emissions by source.

[9] In line with GHGI convention, rail figures include passenger and freight transport, but exclude CO_2 from electric trains.

Table 2: Emission levels and trends in road transport by sources

Source	Emissions 2006 ($ktCO_{2e}$)	% of road transport emissions (2006)	Average growth p.a. (1990-2006)	Growth (2005 – 2006)	% of equivalent UK average emissions
Cars	6055	57.6%	0.3%	-0.1%	8.3%
HGVs	2221	21.1%	0.5%	2.7%	8.5%
LGVs	1716	16.3%	4.2%	5.2%	8.5%
Buses & coaches	421	4.0%	0.5%	6.9%	8.5%
Other	53	0.5%	5.9%	2.5%	9.8%
Motorpeds & Motorcycles	39	0.4%	-1.8%	-5.8%	8.2%
Total	10506	100.0%	0.9%	1.6%	8.4%

Analysis by road type

The GHGI database allocates transport emissions across three road types: rural, urban and motorway. In 2006, rural driving was the greatest contributor to total road emissions (40.5%), followed by urban driving (34.1%) and then motorway (24.8%).

However, emissions from motorway driving have grown the fastest of these three, with an average growth rate of 2.1% p.a. since 1990, and by 2.6% between 2005 and 2006. The resulting increase in the share of emissions from motorway driving is offset against a decline in the share of emissions from urban driving.

Table 3: Emissions levels and trends in road transport by road type

Source	Emissions 2006 ($ktCO_{2e}$)	% of road transport emissions (2006)	Average growth p.a. (1990-2006)	Growth (2005 – 2006)	% of equivalent UK average emissions
Rural	4,259	40.5%	1.1%	2.2%	8.4%
Urban	3,586	34.1%	-0.2%	0.1%	8.3%
Motorway	2,607	24.8%	2.1%	2.6%	8.4%
Other	53	0.5%	5.9%	2.5%	9.8%
Total	10,506	100.0%	0.9%	1.6%	8.4%

2.3 Vehicle Efficiency Per Kilometre

Travel by different modes has differing impacts in terms of emissions of CO_{2e} per passenger kilometre. Defra's Company Reporting Guidelines[10], published in June 2009, allow the CO_{2e} per passenger kilometre of these different modes to be compared. Table 4 below demonstrates these figures.

Table 4: CO_2 emissions per passenger kilometre

Sector	Mode	gCO_{2e}/pkm
Road[11]	Average petrol car	130 (109)
	Average diesel car	124 (96)
	Average car (all)	128 (106)
	Average petrol motorbike	119
	Average bus	105
	Average coach	31
Rail	National rail	61
	Light rail and tram	84
Ferry (Large RoPax)	Average foot and car passengers	116
Aviation[12]	Domestic flights	173
	Short haul international	99
	Long haul international	113

All figures are estimated using data for GB/UK as a whole so do not specifically relate to Scotland. Furthermore, for some modes, including rail, these figures may be based upon a different methodology than that used to calculate the figures in Table 1 previously. The car figures in brackets are taken from the 2008 DfT publication 'Carbon Pathways Analysis: Informing Development of a Carbon Reduction Strategy for the Transport Sector'[13]. This calculates efficiency figures using a traffic weighted

[10] 2009 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting (2009), Produced by AEA for the Department of Energy and Climate Change (DECC) and the Department of Environment, Food and Rural Affairs (Defra)

[11] All Car figures assume an average car occupancy rate of 1.6 passengers.

[12] The long haul estimate is based on a flight length from the Guidelines of 6482 km, short haul 1108km and domestic 463km. In keeping with evidence from the IPCC, a 9% uplift factor has been applied to account for non-direct routes, circling and congestion. The emission factors refer to aviation's direct carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) emissions only. There is currently uncertainty over the other non-CO2 climate change effects of aviation (including water vapour, contrails, NOx etc) which may indicatively be accounted for by applying a multiplier. The appropriate factor to apply is subject to uncertainty but was estimated by the IPCC in 1999 to be in the range 2-4, with current best scientific evidence suggesting a factor of 1.9. If used, this factor would be applied to the emissions factors set out here.

[13] Carbon Pathways Analysis: Informing Development of a Carbon Reduction Strategy for the Transport Sector (2008), Department for Transport

average car emission factor to take account of the fact that lower CO_2 emitting cars such as newer cars and diesel cars, are on average driven more than higher CO_2 emitting cars such as older cars or sports cars.

Chapter 3: Emissions Impact of Transport Interventions

3.1 Background

This chapter lists those transport interventions, whether devolved or reserved to the UK/EU, that are firm commitments and are expected to have a direct and significant impact on Scottish transport emissions after the time period captured by the GHGI (1990–2006). For clarity, measures are separated between those that are infrastructure projects and those that involve fiscal policy or regulation. It highlights the original objective of the interventions and provides background information where relevant. Emissions impacts are those stated in the original appraisal report or equivalent published document, and have been rounded to the nearest 1ktCO_2e where appropriate to reduce the risk of spurious accuracy. Whilst the emissions figures themselves remain unaltered, the years that they are associated with may have been updated to reflect the latest transport programme.

As well as reporting the emissions impacts, where possible the chapter outlines the general methodological approach for estimating the impact of both infrastructure projects and fiscal/regulatory policies. As is apparent, the precise estimation methodology may differ significantly depending upon the type of intervention and original model utilised. Furthermore, for many interventions there are likely to be a number of localised impacts. These may be neither captured nor presented consistently between appraisals but, where possible, the impacts presented here are the *net* emissions impact at a national level.

As a result of such methodological variation, as well as the fact that emissions estimates are frequently assessed in isolation, and so don't include the interactions between measures or the impact of any future measures, the emissions estimates and related timescales are to be used as an informative guide to the direction of change and the order of magnitude only. **The comparison, addition or netting off of emissions estimates between interventions or against the GHGI data is not statistically valid and may lead to incorrect conclusions being drawn.**

3.2 Infrastructure Projects

Methodology

Environmental impacts from infrastructure projects are taken from the latest published estimates. In most cases, this will be the carbon estimate contained in the specific Environmental Statement. Some projects may not yet have undergone a formal Environmental Statement; where this is the case the carbon estimate is taken from the environmental chapter of the STAG Appraisal report. In general, where more than one set of figures exists, the most recent figures take precedence. For reference, links to the project home page are also provided where an online version is available.

STAG recommends that CO_2 emissions from road traffic are calculated according to the methodology in the Design Manual for Roads and Bridges[14] (DMRB). DMRB was first introduced in 1992 in England and Wales, and subsequently in Scotland and Northern Ireland. It provides a comprehensive manual system which accommodates current Standards, Advice Notes and other published documents relating to Trunk Road Works.

Data regarding emissions associated with the running of diesel and electric trains is at present limited. The research is ongoing to obtain more robust evidence to use for the estimation of emissions from rail. Prior to the outcome of this research, STAG recommends the use of the Rail Emission Model Final Report[15] that was produced for the Strategic Rail Authority. This is published on the Department for Transport website, and provides estimated emission factors and detailed data for individual diesel and electric train types.

There are no such established guidelines for estimating carbon estimates for other travel modes. Where projects do concern other modes, for example the Edinburgh Tram, the methodology used to estimate the carbon impact will be tailored specifically to that individual project and highlighted as such below.

[14] Design Manual for Roads and Bridges (2009), Highways Agency
[15] Rail Emission Model (2001), AEA Technology Environment

Excluded from this analysis is the Strategic Transport Projects Review (STPR), with the exception of those projects that are to be 'fast-tracked' (i.e. the Forth Replacement Crossing and Edinburgh-Glasgow (Rail) Improvements Programme). Undertaken by Transport Scotland and announced by The Minister for Transport, Infrastructure and Climate Change in December 2008, the STPR sets out the strategic transport investment priorities for the next twenty years and provides the basis on which Ministers can make informed decisions about future transport spending beyond the current programme. Individual projects from within STPR will be included as and when they become committed schemes with a designated timescale for implementation.

Road

M77 – Junction 2 Pollok

- Document: Environmental Statement Volume 1 (2005), RPS Group
- Construction completion: 2007
- Estimated emissions impact: +3ktCO_2 p.a. from 2007; +3ktCO_2 p.a. from 2010

This project altered the layout of the M77 Junction 2 Interchange near Pollok Town Centre, Glasgow.

Compared to the baseline situation, there is estimated to be an increase in emissions of all pollutants with the proposed scheme and associated development. This is due to the general increase in traffic, primarily concentrated along Barrhead Road, the M77 south of junction 2 and the new Connector Road to the new sliproads.

A876 Upper Forth Crossing at Kincardine

http://www.transportscotland.gov.uk/projects/upper-forth-crossing

- Document: Environmental Statement (2003), Babtie
- Construction completion: 2008
- Estimated emissions impact: +5ktCO2 p.a. in 2009; +8ktCO_2 p.a. in 2021

The new £120 million Clackmannanshire Bridge over the Firth of Forth was officially opened on the 19th November 2008. This project is designed to improve the road network within and around the village of Kincardine. The existing Kincardine Bridge requires substantial refurbishment. Without the new bridge, traffic would otherwise have to divert to Stirling or the Forth Road Bridge in order to cross the Forth, resulting in major disruption to the wider road network.

It is estimated that CO_2 emissions increase with time due to the predicted increase in traffic as a result of the new crossing; an estimated 8,000 additional vehicles a day would be attracted to the area.

Note that the final construction completion date of 2008/09, as specified in Transport Scotland's Scottish Motorway and Trunk Road Programme (SMTRP), is later than the original 2006 emissions impact estimate as published in the Environmental Statement.

M80 Stepps-Haggs

http://www.transportscotland.gov.uk/projects/trunk-road-projects/m80-stepps-to-haggs-project

- Document: Environmental Statement (2004), Babtie
- Anticipated construction completion: 2011/12
- Estimated emissions impact: +40ktCO_2 p.a. from 2012; +40ktCO_2 p.a. from 2025

This project is to upgrade the A80 between Stepps and Haggs to motorway standard.

The change in carbon dioxide emissions results from the predicted increase in traffic volume and an increase in the average vehicle speed on the A80 from 69kph to 88kph.

M74 Completion

http://www.transportscotland.gov.uk/projects/m74-completion

- Document: Environmental Statement (2003), ERM
- Anticipated construction completion: 2011/12
- Estimated emissions impact: +87ktCO_2 p.a. from 2012; +135ktCO_2 p.a. from 2020

The M74 Completion project will complete a vital part of the west of Scotland's motorway network. The new eight kilometres (five miles) stretch of road will continue the M74 motorway from Fullarton Road Junction, near Carmyle, to the M8 motorway west of the Kingston Bridge. Construction work on the road began in May 2008 and is scheduled for completion in 2011.

The scheme is predicted to cause an increase in global emissions of carbon dioxide due to the overall increase in vehicle kilometres travelled on the road network. Note that the revised anticipated construction completion date of 2011/12, as specified in Transport Scotland's Scottish Motorway and Trunk Road Programme (SMTRP), is a year later than the original 2010 emissions impact estimate as published in the Environmental Statement.

A75 Dunragit Bypass

http://www.transportscotland.gov.uk/projects/trunk-road-projects/a75-dunragit-bypass-project

- Document: Environmental Statement, Young Associates / Mouchel Parkman
- Anticipated construction completion: 2012/13
- Estimated emissions impact: +4ktCO_2 p.a. from 2022

Drivers currently experience limited overtaking opportunities along much of the A75, which leads to traffic congestion and creates driving conditions which lower average speeds, increased driver frustration and the potential for accidents. The proposed scheme will comprise an off-line road alignment and, in accordance with its stated objective, will provide guaranteed overtaking in both eastbound and westbound

directions. The additional CO_2 emissions are expected as a result of the increase in distance that vehicles will travel due to the addition of the bypass.

M74 Raith Interchange

http://www.transportscotland.gov.uk/projects/trunk-road-projects/m74-raith-interchange

- Document: Environmental Statement (2007), Mouchel Fairhurst JV
- Anticipated construction completion: 2012/13
- Estimated emissions impact: +10ktCO_2 p.a. from 2013; +10ktCO_2 p.a. from 2020

The scheme is aligned with the M8 Baillieston to Newhouse works and the Associated Network Improvements**.** These are vital links in the trunk road network of Central Scotland and serve substantial existing developments as well as some of the most substantial future development sites in Scotland.

Severe traffic problems exist at Raith Junction due to the interaction of heavy turning volumes from the A725 and the M74 at the signalised roundabout. This scheme aims to relieve traffic congestion at the junction.

M8 Associated Network Improvements

http://www.transportscotland.gov.uk/projects/trunk-road-projects/m8-associated-network-improvement-study

- Document: Environmental Statement, 2008 (Mouchel Fairhurst JV)
- Anticipated construction completion: 2012/13
- Estimated emissions impact: +0ktCO_2 by 2013; +2ktCO_2 p.a. by 2020

This study is looking at a series of options for capacity improvements on sections of the M73, M74 and M8 adjacent to Baillieston and Maryville interchanges as a result of changes to east-west traffic patterns once the extension to the M74 and improvements to the M8 are in place. A range of strategies are being examined, from the application of demand management techniques within the existing

carriageway, to the introduction of hard shoulder running and free flow links between junctions.

A90 Balmedie-Tipperty

http://www.transportscotland.gov.uk/projects/trunk-road-projects/a90-balmedie-to-tipperty-dualling-project

- Document: Environmental Statement (2007), Grontmij / Natural Capital
- Anticipated construction completion: 2012/13
- Estimated emissions impact: +2ktCO_2 p.a. from 2013

This project involves the proposed dualling of the A90 between Balmedie and Tipperty. These improvements will provide continuous dual carriageway between Aberdeen and Ellon, which will remove the bottleneck caused by the existing single carriageway. The local community has been pressing for this upgrade for a number of years.

The increase in emissions is due to the increase in the road sections that make up the total road assessed.

A90 Aberdeen Western Peripheral Route

http://www.awpr.co.uk/

- Document: Environmental Statement (2007), Jacobs
- Anticipated construction completion: 2012/13
- Estimated emissions impact: +29ktCO_2 p.a. from 2013; +37ktCO_2 p.a. from 2027.

A peripheral route around Aberdeen is proposed to reduce the high volumes of traffic using the A90 in the centre of Aberdeen, and to reduce the traffic congestion that the city experiences as a result of the volume of traffic using the A90 and its associated radial roads. The overall increase in the number of road vehicles, however, is expected to lead to an increase in CO_2 emissions.

M8 Baillieston-Newhouse

http://www.transportscotland.gov.uk/projects/trunk-road-projects/m8-baillieston-to-newhouse

- Document: Environmental Statement (2007), Mouchel Fairhurst JV
- Anticipated construction completion: 2013/14
- Estimated emissions impact: +30ktCO_2 p.a. from 2014; +30ktCO_2 p.a. from 2020

This project is a proposal to upgrade the existing A8 between Baillieston and Newhouse to dual three-lane motorway standard or equivalent.

The DMRB was used to calculate the change in greenhouse gas emissions, therefore the assessment has included all traffic on the entire modelled network, not just links that were explicitly included in the local assessment. The increase in emissions is due to an increase in predicted traffic levels.

Forth Replacement Crossing

http://www.transportscotland.gov.uk/projects/forth-replacement-crossing

- Document: STAG (2007), Jacobs
- Anticipated construction completion: 2016/17
- Estimated emissions impact: -23ktCO_2 p.a. from 2017

The Forth Replacement Crossing was a fast tracked component of the Strategic Transport Projects Review (STPR). The Forth Replacement Crossing will comprise a cable stayed bridge across the River Forth, west of the existing Forth Road Bridge with associated connecting roads. The Forth Road Bridge will be retained as a public transport corridor and continue its use by pedestrians and cyclists, as part of a Managed Crossing Scheme.

The Forth Replacement Crossing and its networks will ensure that a key river crossing is maintained. In doing so it will protect the economy of Fife, Edinburgh and beyond from disruption stemming from the uncertainty of the long term viability and operation of the Forth Road Bridge and concerns over the current operational characteristics of the surrounding road network.

The Managed Crossing Scheme will also offer the opportunity to develop bus, tram or light rail systems connecting Fife, Edinburgh and West Lothian, so encouraging the use of more sustainable modes of transport. The scheme will also support the reduction in travel times and improve journey time reliability for cross Forth trips and improve connections to areas of economic activity including West Edinburgh, Grangemouth, Rosyth and Dundee.

Design development of the Forth Replacement Crossing is ongoing. The primary factors affecting how soon the project can be delivered will be the resolution of statutory processes and the funding to carry the intervention forward to completion.

The emissions estimate quoted above is from the original STAG appraisal which used a baseline of no crossing (closure of Forth Road Bridge) and re-routeing of journeys via Kincardine. This scheme design has since been superseded to baseline of retaining the existing bridge, although there is no quantified update of the emissions estimate to date. An Environmental Statement, including updated quantified CO_2 emissions, is currently being prepared on this basis, with publication due in November (alongside the introduction of the Bill). Early indications are that this Environmental Statement will show net increases in operational carbon emissions, when compared with a baseline of traffic continuing to use the Forth Road Bridge. The CAT will be adjusted to reflect these figures as and when they are confirmed.

Rail

Mossend Freight Gauge Enhancement

- Document: STAG (2005), Steer Davies Gleave (& internal calculation)
- Construction completion: 2007
- Estimated emissions impact: Cumulative decrease of -280ktCO_2 to -314ktCO_2 over 30 years

This project is to enhance and increase the movement of goods to and from the North East of Scotland by rail, in particular to maintain existing rail traffic and encourage new rail traffic. It involves the enhancement of gauge on the rail line between Mossend and Aberdeen, Inveurie and Elgin.

The appraisal methodology in the STAG report is based around the removal of HGVs from the road network, through maintaining existing rail freight traffic and allowing traffic currently out of gauge to be moved by rail. In the central case it is estimated there will be 3.2 round rail trips per day, which is equivalent to 66.5 lorry trips/day. Consequently, based upon average trip lengths and over the 30-year period, it is estimated that 370.3 million vehicle kilometres will be removed from the road network.

The 2009 Guidelines to Defra's GHG Conversion Factors suggest that the average UK articulated lorry emits 0.944kgCO_2/km. Applying this figure to the 370.3 million vehicle kilometres[16], and assuming that rail freight emits approximately 10-20% of the emissions per vehicle kilometre of the road freight that it replaces, gives the total CO_2 saving stated above.

Stirling-Alloa-Kincardine Railway Line

http://www.transportscotland.gov.uk/projects/SAK-railway-project

- Document: Stirling-Alloa-Kincardine Rail Line Reopening Benefit Study (2002), MVA / David Simmonds Consultancy / Environmental Resources Management
- Construction completion: 2008
- Estimated emissions impact: +2ktCO_2 p.a. from 2009

In May 2008, the Stirling-Alloa-Kincardine railway line re-opened for the first time in over 40 years. As one of the most important railway infrastructure projects in recent years, the reopening of the Stirling-Alloa-Kincardine line will deliver major social, economic and environmental benefits to the communities directly concerned and also to Scotland as a whole.

[16] This makes the simplifying assumption that fuel efficiency remains constant over the 30 year period. In reality, this is unlikely to be the case.

The environmental appraisal follows the guidance set out in STAG and the DMRB. Emissions have been calculated on the basis of new railway movements along the Stirling to Kincardine railway as well as changes to movements of freight (and passenger) trains on other sections of the railway network. The railway will carry combined high volume freight and passenger services.

Glasgow Airport Rail Link (GARL)

http://www.transportscotland.gov.uk/projects/garl

- Document: Environmental Statement (2006), Faber Maunsell / AECOM
- Anticipated construction completion: 2013
- Estimated emissions impact: -2ktCO_2 p.a. in 2014

This project seeks to provide a fixed railway link with sufficient capacity to enable a dedicated train service to operate every 15 minutes between a new station at Glasgow Airport and Glasgow Central Station, calling at Paisley Gilmour Street.

As a result of the project, airport passengers that would normally approach the airport along the M8 from the east of the city and its conurbation, will be able to utilise public transport to Glasgow Central, and then the new rail link to the airport. It was estimated that passenger numbers using GARL will be 1,388,000 initially, rising to 1,849,000 in the long-run. Using the assumption that an average road journey saved by the opening of the rail link is 16km, the initial net saving in CO_2 emissions is estimated to be 2ktCO_2 per annum.

The revised anticipated construction completion date of 2013 is later than the original 2009 emissions impact estimate as published in the Environmental Statement.

Borders Railway

http://www.waverleyrailwayproject.co.uk/

- Document: Borders Railway Design Development Appraisal (2008), Transport Scotland
- Anticipated construction completion: 2013

- Estimated emissions impact: Cumulative decreases of -74ktCO_2 by 2030, -238KtCO_2 by 2050 and -415ktCO_2 by 2070.

This project is to reinstate the former Waverley rail route from the Scottish Borders to Edinburgh.

The change in CO_2 emissions has been calculated in line with STAG guidelines. For road traffic, the calculations are based on changes to the number of car journeys between the different stations, with each journey modelled separately. The emissions from the railway have been calculated in line with the Rail Emissions Model produced by the Strategic Rail Authority.

Overall, the Borders Railway Project will have a beneficial impact on CO_2 levels. The most recent assessments suggest that it will save emissions from the opening year, and deliver significant long-term benefits, removing approximately 415ktCO_2 over the appraisal period to 2070.

Edinburgh-Glasgow (Rail) Improvements Programme

- Document: Draft Outline Business Case (2009), Transport Scotland
- Anticipated construction completion: Phased to 2016
- Estimated emissions impact: Average annual savings of -20ktCO_2, with cumulative savings of -1,181ktCO_2 by 2075.

This intervention was identified early in the STPR and brought forward in a study which considered improvements to the capacity, frequency and journey time of rail services between Edinburgh and Glasgow.

The change in CO_2 emissions has been calculated in line with guidance from the Department for Energy and Climate Change. Rail emissions have been calculated using the environmental module of the Network Modelling Framework. Changes in road emissions are assumed to be negligible and have been treated as zero.

The Edinburgh Glasgow Improvement Programme is expected to result in a significant reduction in emissions, through the electrification of approximately 350 km of single track and the resulting move from diesel to electric trains. The programme therefore achieves the majority of its emissions reductions through transferring emissions from the non-traded sector to the traded sector, as demonstrated in the table below.

Table 5: Change in CO_2 emissions from EGIP by sector

Budget Period	Kilotonnes of CO_2	
	ETS (Electricity)	Non-ETS (Fossil Fuels – diesel)
2008 - 2012	0	0
2013 - 2017	25	-39
2018 - 2022	62	-98
2023 onwards	658	-1,043
UK Net	N/A	-1,181

Other

Edinburgh Tram Lines 1a and 1b

http://www.tiedinburgh.co.uk/

- Document: STAG part 2 appraisal (2006), Steer Davies Gleave / Colin Buchanan
- Anticipated construction completion: 2011
- Estimated emissions impact: +98ktCO_2 p.a. from 2011; +177ktCO_2 p.a. from 2031.

The proposed tram lines Phases 1a and 1b are due to open in 2011 with 1a running between Edinburgh Airport and Newhaven via Princes Street, and 1b running between Haymarket and Newhaven via the Roseburn corridor.

Extensive work has been undertaken to build new demand forecasting models to predict use of the tram and the impact upon use of other transport: bus, rail and car, rather than use existing models, such as DMRB, which have been used to assess other policies/projects. The results from this Edinburgh based model determined the emissions levels that are reported. Emissions from tram operation are calculated

from estimates of power consumption for the tram and standard factors for CO_2 emissions from UK electricity generation. The operation of Edinburgh Tram is predicted to have an annual power consumption of 11.04 kWh/veh-km. It is assumed that this power comes from the National Grid, using an emission factor of 0.43kg of CO_2 per kWh of electricity generated.

The STAG reports that the Do-Something scenario i.e. building the tram network, includes a higher level of development along the tram corridor than in the Do-Minimum/Reference Case. The effect of this is to increase the overall volume of movements in the 'with tram' case, which could potentially include a higher number of car trips than in the Do-Minimum even after the switch from car to tram has taken place. The CO_2 emissions resulting from power consumption by the tram are added to the additional emissions from road traffic. Both Phase 1a and 1a+1b would increase the level of CO_2 emissions marginally, as a result of traffic re-routing and demand redistribution. Without the tram, it is possible that the developments would take place elsewhere, most likely in peripheral locations with a higher proportion of car usage and longer trip lengths, but these 'disbenefits' have not been accounted for. Without the effect of the larger assumed travel market in the with-tram situation, the increases in emissions would be approximately half of those reported.

Table 6 summarises this previous information. Whilst this may prove a useful reference table, it should be reiterated that these emissions estimates are not produced using a single, consistent methodology and, therefore, are not directly comparable.

Table 6: Emissions impact estimates of transport infrastructure projects

Project title	Published emissions estimate
M77 Junction 2 Pollok	+3ktCO_2 p.a. from 2007 + 3ktCO_2 p.a. from 2010
A876 Upper Forth Crossing at Kincardine	+5ktCO_2 p.a. from 2009 +8ktCO_2 p.a. from 2021
M80 Stepps-Haggs	+40ktCO_2 p.a. from 2012 +40ktCO_2 p.a. from 2025
M74 Completion	+87ktCO_2 from 2012 +135ktCO_2 from 2020
A75 Dunragit Bypass	+4ktCO2 p.a. from 2022
M74 Raith Interchange	+10ktCO_2 p.a. from 2013 +10ktCO_2 p.a. from 2020
M8 Associated Network Improvements	+0ktCO_2 p.a. by 2013 +2ktCO_2 p.a. by 2020
A90 Balmedie-Tipperty	+2ktCO_2 p.a. from 2013
A90 Aberdeen Western Peripheral Road	+29ktCO_2 p.a. from 2013 +37ktCO_2 p.a. from 2027
M8 Baillieston-Newhouse	+30ktCO_2 p.a. from 2014 +30ktCO_2 p.a. from 2020
Forth Replacement Crossing	-23ktCO_2 p.a. from 2017
Mossend Freight Gauge Enhancement	-280KtCO_2 to -314ktCO_2 total savings over 30 years
Stirling-Alloa-Kincardine Railway Line	+2ktCO_2 p.a. from 2009
Glasgow Airport Rail Link	-2KtCO_2 p.a. in 2014
Borders Railway	-74ktCO_2 total savings by 2030 -238ktCO_2 total savings by 2050 -415ktCO_2 total savings by 2070
Edinburgh-Glasgow (Rail) Improvements Programme	-20ktCO_2 p.a. from 2017 -1,181kt CO_2 total savings by 2075
Edinburgh Tram Lines 1a and 1b	+98ktCO_2 p.a. from 2011 +177ktCO_2 p.a. from 2031

The emission estimates within this table are forecast increases in carbon dioxide emissions with the project compared to without the project in a given future assessment year. These estimates have been calculated using a variety of methodologies and, consequently, it is not statistically valid to aggregate the individual figures or directly compare them with one another.

3.3 Fiscal / Regulatory Measures

Methodology

The current split between devolved and reserved powers means that the majority of fiscal and regulatory measures are taken at either the UK or EU level.

The aggregate UK impact of these measures are published in Impact Assessments for individual measures and/or documents such as 'Climate Change: The UK Programme 2006'[17], 'Meeting the Energy Challenge: A White Paper on Energy'[18], and the annual HM Treasury (HMT) Budget and Pre-Budget reports. For the purpose of the CAT, we treat these estimates as being the most reliable available. We do not attempt here to identify what proportion of the aggregate UK or European emissions impact is specifically realised in Scotland.

Freight Modal Shift Grants

http://www.scotland.gov.uk/Topics/Transport/FT/freightgrants1

- Document: Internal calculation (2008)
- Implementation date: Ongoing
- Estimated emissions impact: Not quantified

The Scottish Government operates 4 freight grant schemes – Freight Facilities Grant (FFG), Rail Environmental Benefits Procurement Scheme (Bulk) (REPS) (B), Rail Environmental Benefits Procurement Scheme (Intermodal) (REPS) (I) and Waterborne Freight Grant (WFG). The aim of all these schemes is to generate environmental benefits by encouraging the transfer of freight from road to rail or water.

Under the FFG Scheme, grants are available towards the capital costs of inland waterway, rail, coastal & short sea shipping freight equipment in cases where the traffic would otherwise move by road. Under the REPS (B) and REPS (I) schemes,

[17] Climate Change: The UK Programme (2006), Presented to Parliament by the Secretary of State for the Environment, Food and Rural Affairs by Command of Her Majesty
[18] Meeting the Energy Challenge: A White Paper on Energy (2007, Department of Trade and Industry

operating subsidy is available to enable rail to compete with road where road is the less costly option. Under the WFG scheme, operating subsidy is available during the start up phase of new inland waterway, coastal and short sea shipping routes where road is the less costly option.

Under these schemes 18 million kilometres of road freight traffic was transferred to rail or water during 2008. Assuming this was replaced by an equivalent distance travelled by less-polluting rail or waterborne traffic, the net emission reduction would have been approximately 14KtCO2e in 2008. Due to the uncertainty of demand for freight grants, we do not attempt to estimate their future impact.

Air Discount Scheme

http://www.airdiscountscheme.com/airds/CCC_FirstPage.jsp

- Document: Internal calculation (2008)
- Implementation date: 2006
- Estimated emissions impact: Negligible

The Air Discount Scheme was introduced in May 2006 as the then Scottish Executive took the view that the lack of affordable air services was acting as a barrier to social and commercial inclusion for remote communities in the Highlands & Islands.

It has been estimated that annual carbon emissions from the air services operating to and from the Highlands and Islands contribute less than 0.3% to the overall emissions from aviation for the whole of the UK, and so any changes in emissions in the Highlands and Islands will have a minimal impact on overall emissions from UK aviation. As the incremental number of passengers travelling in the H&Is as a result of the Air Discount Scheme is less than half the total numbers on these flights, we assume here that the ADS leads to a negligible increase in total emissions.

Removal of tolls from Forth and Tay bridges

http://www.scotland.gov.uk/Topics/Transport/Road/toll-bridges/TollImpactStudy

- Document: Toll Impact Study (2007), Steer Davies Gleave

- Anticipated implementation date: 2008
- Estimated emissions impact: +7.5 $KtCO_2$ to +9.0$KtCO_2$ p.a. from 2008

The Toll Impact Study undertaken by Steer Davies Gleave found that the increase in greenhouse gas emissions, as a result of removing tolls from the Forth and Tay bridges, resulted from an increase in traffic travelling through, in and around Fife only partially offset by a reduction in traffic travelling through Perthshire and Kinross. This trend is a result of the change in route choice between the M90 and the A91/92 once the tolls are removed.

Air passenger duty (APD)

http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_ShowContent&propertyType=document&id=HMCE_CL_000505

- Document: Pre-Budget Report (2008), HMT
- Anticipated implementation date: 2009
- Estimated emissions impact: -2.4$MtCO_2$ in 2011-12 (UK)[19]

Air Passenger Duty (APD) on internal flights was doubled from £5 to £10 with effect from 1st February 2007 in an attempt to reduce the demand for flights. From 1 November 2009, APD will be structured around four distance bands, set at intervals of 2,000 miles from London. This reform will ensure that those flying farther, and therefore contributing more to emissions from aviation, will pay more. The reformed APD delivers savings of 0.4$MtCO_2$ in 2010-11, compared to current APD, and with radiative forcing applied this rises to 0.7$MtCO_2$. APD will deliver savings of 0.6$MtCO_2$ in 2011-12 (1.2$MtCO_2$ with radiative forcing applied). Coupled with savings from doubling APD rates, in 2007, this achieves a combined reduction of 2.4$MtCO_2$ (with radiative forcing applied) in 2011-12.

[19] Includes the doubling of APD rates in 2007 and with radiative forcing applied.

Smarter Choices, Smarter Places

http://www.scotland.gov.uk/Topics/Transport/sustainable-transport/home-zones

- Document: Strategic Environmental Assessment (2008), The Scottish Government
- Implementation date: 2009
- Estimated emissions impact: -71ktCO2 p.a. from 2009

Smarter Choices Smarter Places is a Scottish Government partnership project with COSLA. Designed to increase active travel and public transport use and tackle transport emissions, it will contribute to a number of objectives in the Scottish Government's National Performance Framework, and Local Authorities' Single Outcome Agreements.

The following authorities and regional transport partnership have been successful in attracting Scottish Government funding:

- Dumfries & Galloway and SWestrans - Dumfries
- Dundee - Dundee Health Central
- East Dunbartonshire - Kirkintilloch and Lenzie (under 'Transport and Development')
- East Renfrewshire - Barrhead
- Falkirk - Larbert and Stenhousemuir
- Glasgow - East End Accessibility (supporting Commonwealth Games)
- Orkney – Kirkwall

Activities in these Local Authorities will include: better public transport services and residential improvements; upgrades in walking and cycling infrastructures; studies into travel patterns and access; intensive marketing and awareness campaigns; and workshops and information packs.

Inclusion of aviation in EU Emission Trading Scheme

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:008:0003:01:EN:HTML

- Document: Pre-Budget Report (2008), HMT
- Anticipated implementation date: 2012
- Estimated emissions impact: -133MtCO_2 p.a. in 2015 and 194MtCO_2 p.a. in 2020 across Europe

A Directive to include aviation into the EU Emissions Trading Scheme (ETS) was published in the Official Journal on 13 January 2009. The intention is for the EU ETS to serve as a model for other countries considering similar national or regional schemes, and to link these to the EU scheme over time. Therefore, the EU ETS can form the basis for wider, global action.

Estimated CO_2 savings across Europe will be 133MtCO_2 per year in 2015 and 194MtCO_2 per year in 2020.

Sustainable Transport Measures

http://www.scotland.gov.uk/Topics/Transport/sustainable-transport

- Document: N/A
- Implementation date: Ongoing
- Estimated emissions impact: Not quantified

The Scottish Government is committed to reducing emissions from the transport sector and, as well as the specific Smarter Choices, Smarter Places programme, substantial funding is given to public transport provision and promoting more sustainable travel and transport means. These sustainable transport policies include: eco-driving and SAFED; 'Smarter Choices' including travel plans, information and marketing; encouraging use of cleaner vehicles and alternative fuels where these are sustainable; increasing cycling through the new Cycling Action Plan and completion of the National Cycle Network. Evaluation programmes are being put in place for all of these measures to assess their impacts including GHG emissions.

New Car CO_2 Regulation

http://register.consilium.europa.eu/pdf/en/08/st03/st03741.en08.pdf

- Document: UK Impact Assessment, 2009 (DfT)
- Implementation date: Ongoing
- Estimated emissions impact: -7.6 to -9.2MtCO_2 p.a. in 2020 across the UK

On 6 April 2009 the EU Council of Ministers formally adopted a regulation setting mandatory CO_2 reduction targets for manufacturers registering vehicles in the EU. It sets an EU average emissions target of 130gCO_2/km by 2012 and a longer-term target of 95gCO_2/km by 2020. This represents a reduction in average new car CO_2 emissions of around 40% on current levels.

Analysis by the Department for Transport (DfT) suggests that the regulation will deliver emissions reductions of between 7.6 and 9.2MtCO_2 per year by 2020.

Fuel Duty

http://www.hm-treasury.gov.uk/bud_bud09_index.htm

- Document: Budget Report (2009), HMT
- Implementation date: Ongoing
- Estimated emissions impact: -2MtCO_2 p.a. by 2013-14 across the UK

It is the UK Government's policy that fuel duty rates should rise each year at least in line with inflation as the UK seeks to reduce polluting emissions and fund public services. As announced in Budget 2007 and confirmed in the 2008 Pre-Budget Report, main fuel duty rates rose by 1.84 pence per litre on 1 April 2009. Budget 2009 announced that main fuel duty will increase by a further 2 pence per litre on 1 September 2009, and by 1 penny per litre in real terms on 1 April each year from 2010 to 2013. This will save 2MtCO2 per year by 2013-14.

Biofuels and the Renewable Transport Fuels Obligation

http://www.hm-treasury.gov.uk/bud_bud08_index.htm

- Document: Budget Report (2008), HMT
- Implementation date: Ongoing

- Estimated emissions impact: -2.6 to -3$MtCO_2$ in 2010-11 from RTFO (UK)
  -0.3$MtCO_2$ in 2012-13 from abolition of the biofuels duty differential (UK)

The King Review[20] highlights that in the longer term, biofuels have the potential to make a significant contribution towards reducing emissions in the transport sector. However, in light of emerging evidence on indirect impacts from biofuels production, the UK Government in spring 2008 asked Professor Ed Gallagher to lead a study into the wider environmental and economic impacts of biofuels. Professor Gallagher reported that biofuels could contribute to a sustainable transport system, but that there is a risk that current policies could lead to a net emissions increase; loss of biodiversity; and contribute to rising prices for some commodities, notably oilseeds[21]. As a consequence he recommended that the rate at which biofuels are incentivised through the Renewable Transport Fuel Obligation should be slowed, reaching 5 per cent only in 2013-14. The UK Government accepted this recommendation, and is negotiating in Europe to ensure sustainable biofuel criteria across the EU.

The RTFO is expected to save between 2.6 to 3$MtCO_2$ in 2010-11. The abolition of the biofuels duty differential is expected to deliver additional annual emissions savings of 0.3$MtCO_2$ in 2012-13.

Reform of Vehicle Excise Duty

http://www.hm-treasury.gov.uk/prebud_pbr08_index.htm

- Document: Pre-Budget Report (2008), HMT
- Anticipated implementation date: 2010
- Estimated emissions impact: Cumulative UK saving of 1.0 $MtCO_2$ by 2020

Since 2001, vehicle excise duty (VED) has been based on different rates depending on carbon dioxide emissions from cars. The UK Government announced further reforms of vehicle excise duty at Budget 2008 to incentivise the purchase and manufacture of more fuel-efficient cars. These included an increase in the number of

[20] The King Review of low carbon cars (2007), King, Julia.
[21] The Gallagher Review of the indirect effects of biofuels production (2008), Renewable Fuels Agency

VED bands from seven to thirteen, from April 2009. These new bands will reflect changes in the fuel efficiency of vehicles and will also provide a greater incentive for drivers choosing a lower-carbon version of car within their preferred class, whether purchasing in the new or second-hand market.

The subsequent Pre-Budget Report confirmed the introduction of the new bands in 2009. However, it also announced that there will now be no significant rate changes until 2010.

Reforms to VED, including the introduction of new bands from April 2009 and First-Year Rates from April 2010, are estimated to result in a cumulative UK saving of 1.0MtCO_2 by 2020, including the impacts of staggering the reforms. However, this assessment only includes impacts in the new car market, and these figures will contribute to the delivery of the savings from the EU regulation on CO2 from cars, rather than constitute additional savings.

Company car tax

http://www.hm-treasury.gov.uk/bud_bud08_index.htm

- Document: Budget Report (2008), HMT
- Anticipated implementation date: 2010-11
- Estimated emissions impact: -1.5 to -3.3MtCO_2 per year in the long-term (UK)

The UK Government announced in Budget 2008 that it will be increasing company car tax (CCT) rates on all but the cleanest cars emitting less than 135gCO_2 per km in 2010-11. CO_2 emissions savings of the 2005 reformed CCT system are estimated to be significant, and are forecast to rise to between 1.5 and 3.3MtCO_2 per year in the long-term.

As with the impact of VED above, these figures contribute to the delivery of the savings from the EU regulation on CO2 from cars, as opposed to additional savings.

Company car fuel benefit charge (FBC)

http://www.hm-treasury.gov.uk/bud_bud08_index.htm

- Document: Budget Report (2008), HMT
- Anticipated implementation date: 2010-11
- Estimated emissions impact: Not quantified

The number of company car drivers getting free fuel for private use has fallen by around 600,000 since 1997, partly as a result of changes to the company car tax system in April 2002 and changes to the fuel benefit rules in April 2003, helping to reduce levels of CO_2 emissions, local air pollutants and congestion. Increasing the FBC in line with the changes in the retail prices index in 2008-09 will deliver a small additional reduction in CO_2 emissions.

Ultra-low carbon vehicles in the UK

http://www.berr.gov.uk/files/file51017.pdf

- Document: Ultra-low carbon vehicles in the UK (2009), DfT, BERR & DIUS
- Anticipated implementation date: 2011
- Estimated emissions impact: Not quantified[22]

Up to £20 million will be available to support the roll-out of charging infrastructure needed to grow the market for ultra-low carbon cars. Cities and regions, in conjunction with the private sector, will be able to bid for this seed funding.

The majority of the £250 million, however, will be used to reduce up-front costs of early electric and plug-in hybrid cars by between £2,000 and £5,000. The UK Government will begin discussions with the automotive and finance industries, as well as other key stakeholders, to explore how best to deliver this incentive from 2011.

[22] A primary outcome of this intervention will be to facilitate the savings attributed to the 'New car CO2 Regulation'.

Table 7 summarises this previous information. As with table 5 previously, these emissions estimates are not produced using a single, consistent methodology and, therefore, are not directly comparable.

Table 7: Emissions impact estimates of fiscal / regulatory measures

Project title	Published emissions estimate
Freight Facilities Grants	Not quantified
Air Discount Scheme	Negligible
Removal of tolls from Forth and Tay bridges	+8ktCO_2 to +9ktCO_2 p.a. from 2008
Air passenger duty	-2.4MtCO_2 in 2011-12 (UK)
Smarter Choices, Smarter Places	-71ktCO2 p.a. from 2009
Inclusion of aviation in EU ETS	-133MtCO_2 p.a. in 2015 -194MtCO_2 p.a. in 2020 (Europe)
Sustainable transport measures	Not quantified
New Car CO_2 Regulation	-7.6 to 9.2MtCO_2 p.a. in 2020 (UK)
Fuel Duty	-2MtCO_2 p.a. by 2013-14 (UK)
Biofuels and the Renewable Transport Fuels Obligation	-2.6 to -3MtCO_2 in 2010-11 from RTFO -0.3MtCO_2 in 2012-13 from abolition of the biofuels duty differential (UK)
Reform to vehicle excise duty[23]	-1.0MtCO_2 total savings by 2020 (UK)
Company car tax	-1.5 to -3.3MtCO_2 p.a. in the long-term (UK)
Company car fuel benefit charge	Not quantified
Ultra-low carbon vehicles in the UK	Not quantified

The emission estimates within this table are forecast increases in carbon dioxide emissions with the policy compared to without the policy in a given future assessment year. These estimates have been calculated using a variety of methodologies and, consequently, it is not statistically valid to aggregate the individual figures or directly compare them with one another.

[23] The impacts from both VED and company car tax contribute to the delivery of the savings from the EU regulation on CO2 from cars, as opposed to representing additional savings.

Chapter 4: Summary

The Scottish Government is committed to tackling climate change, and has put in place a framework that will deliver greenhouse gas emission reductions of 42% by 2020 and 80% by 2050 (compared to a 1990/95 baseline).

We are aware, and have demonstrated in Chapter 2, that transport has a significant role to play in meeting these targets. Consequently, we are putting measures in place now to slow the increase in transport emissions and, ultimately, to reduce transport's climate change impact. Investment in major railway infrastructure such as the Edinburgh to Glasgow Improvements Programme and Borders Railway, and in policies such as the Freight Facilities Grants and Smarter Choices, are all decisions being taken at the devolved level with the clear intention of reducing transport emissions. Furthermore, there is strong support from the Scottish Government for wider measures such as the New Car CO_2 Regulation, the Renewable Transport Fuels Obligation and the inclusion of aviation in the EU ETS. These will make a long lasting and permanent reduction in Scotland's transport emissions.

We are also currently consulting on Low Carbon Vehicles[24] (LCVs) and The Cycling Action Plan for Scotland (CAPS)[25]. The LCV consultation is seeking views from a range of stakeholders on potential opportunities and barriers, as well as opinions on policy options, on LCVs[26] and alternative fuels in Scotland. The purpose of this consultation is to inform the development of policy and a way forward for the introduction and promotion of LCVs and alternative fuels. The aim of CAPS is to get more people to cycle more often, with a vision of achieving a 10% modal share for cycling by 2020 (currently 2% of people cycle to work and 1% of children cycle to school). Moving towards a modal share of 10% for bikes by 2020 would be a small but significant contribution to the Government's Climate Change target, especially if the cyclists can be taken out of cars and not from other forms of public transport.

[24] Consultation on Low Carbon Vehicles (2009), The Scottish Government
[25] Cycling Action Plan for Scotland (2009), The Scottish Government
[26] A 'low carbon vehicle' is defined as being powered by alternative fuels or technologies, including: electric vehicles, hybrids, hydrogen vehicles or equivalent.

However, as is shown, there are also several infrastructure projects where construction is underway or planned over the next few years. Whilst these impacts are not measured on a like for like basis, and consequently can't be compared against each other, it is clear that several of these are anticipated to increase emissions in the future. This reflects the fact that in order to deliver the Scottish Government's Purpose and to achieve all of the strategic outcomes within the NTS, infrastructure improvements will be necessary. This is why there are five criteria in STAG, including Environment, each of which are implicitly weighted equally. Nonetheless, we recognise that, where STAG demonstrates that an infrastructure project represents best value for money and recommends that it should proceed, it is still important to minimise the emissions impact of the project.

Transport Scotland (TS) have developed a Climate Change Action Plan for the organisation. As part of this work, a major review of sustainability in the design, procurement, construction, maintenance, monitoring and evaluation phases of project deliver has been commissioned. The overall aim of the review is to identify where TS policies, practices and systems in these areas can be improved and to influence the supply chain, not only to adopt more sustainable practices, but to innovate to deliver more sustainable solutions. An important aspect of this project will be the initial development and application of a bespoke carbon management system (CMS), which will help measure the carbon associated with TS operations and drive continuous improvement. Over time, application of the CMS to projects will yield better information about the whole life embedded impacts of transport infrastructure projects. It is possible that these lifecycle emissions could be incorporated into the CAT once the CMS is fully established.

It is our intention that the CAT brings greater transparency to Scotland's transport emissions and, therefore, greater accountability in transport policy. This will mean promoting those measures which reduce emissions, as well as minimising the impact of policies and projects which increase emissions. The CAT will be updated on an annual basis to allow auditing of how well we are meeting these aims. Whilst underlying factors will continue to have a significant influence on transport emissions, as specified in Chapter 2, we will continue to report the marginal impact that projects and policies have upon these background emissions.

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ISBN: 978-0-7559-7625-6

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St Andrew's House
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EH1 3DG

Produced for the Scottish Government by RR Donnelley B61924

Published by the Scottish Government, August 2009